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2 **Supplementary Information for**
3 **Black Lives Matter Protests Shift Public Discourse**

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7 **This PDF file includes:**

- 8 Fig. S1 (not allowed for Brief Reports)
9 Tables S1 to S6 (not allowed for Brief Reports)
10 Legend for Dataset S1

11 **Other supplementary materials for this manuscript include the following:**

- 12 Dataset S1

13 **SI Dataset S1** (<https://osf.io/ubptz/>)

14 Data used to perform analyses have been made available through the Open Science Framework. All data were drawn from
 15 publicly available sources. All data sets were easily accessible, apart from the Elephrame protest data, which we scraped,
 16 processed, and merged with the ACLED protest data.

Table S1. Google search terms by thematic category

BLM	Victims	Historical	Historical Figure
Black Lives Matter	Eric Garner	Abolition	Angela Davis
Police Shootings	Michael Brown	Black Panthers	Malcolm X
	Philando Castile	Black Power	Martin Luther King
	Tamir Rice	Civil Rights	Stokely Carmichael
	Trayvon Martin	Jim Crow	
		Racism	
		Segregation	
		Slavery	
Slogan	Identity Politics	Policy	White Supremacy
Hands Up Don't Shoot	Antiracist	Decriminalization	White Nationalism
I Can't Breathe	Identity Politics	Defund the Police	White Power
Say Her Name	Inequality	Mass Incarceration	White Supremacy
	Institutional Racism	Prison Abolition	
	Social Justice	Prison Reform	
	White Privilege	Redlining	
		The New Jim Crow	
		War on Drugs	

Table S2. Contagious protest events as modeled in Figure 3

Era	Event(s)	Start	End	Duration	Criterion
2014–2015	Eric Garner	2014-07-17	2014-07-25	9	80%
2014–2015	Michael Brown	2014-08-12	2014-08-21	8	80%
2014–2015	Hearings, Tamir Rice	2014-11-24	2014-12-05	12	80%
2014–2015	Freddie Gray	2015-04-20	2015-04-29	10	8 month max, 80%
2016	Philando Castile	2016-07-05	2016-07-16	12	8 month max
2016	National Anthem	2016-09-18	2016-09-28	11	8 month max
2017	Unite the Right	2017-08-11	2017-08-21	11	8 month max
2020	George Floyd	2020-05-25	2020-06-05	12	8 month max

Note: Each event belongs to a particular protest “era” that is represented by a single binary variable in the general additive models of search volume spikes.

Table S3. Generalized additive model (GAM) of co-activation as nonparametric functions of time as visualized as the trend line for Figure 3

	Coefficient
Intercept	−0.14***
Approximate significance of smooth terms:	
Calendar Week ^a	8.94***
Time ^a	7.41***
N	2857
Adj. R ²	0.24
Notes: * $P < .05$; ** $P < .01$; *** $P < .001$	
^a Estimated Degrees of Freedom	

Table S4. Bootstrapped estimates for GAMs of Google search spikes for all thematic term categories as visualized in Figure 4

	All Terms	BLM	Victim	Historical	Historical Figure	Slogan	Identity Politics	Policy	White Supremacy
Intercept (no protest)	-0.03**	-0.08*	-0.03	-0.02**	-0.03	-0.07	-0.04	-0.01	-0.01
Protest: 2014-2015	0.38***	1.39***	1.55***	0.15*	0.38**	1.07*	0.45	-0.17	0.24
Protest: Castile/National Anthem	0.97***	2.72***	1.41***	0.57***	0.52**	1.11	1.00**	1.05***	0.12
Protest: Unite the Right	0.75***	1.46***	-0.25	0.77***	0.34	1.24	1.06*	-0.25	3.09***
Protest: George Floyd	2.02***	4.02***	2.52***	1.18***	1.62***	1.91*	1.75***	1.81***	1.47**
y-lag	-0.34***	-0.10	-0.15***	-0.02	-0.01	-0.46***	-0.36***	-0.36***	-0.37***
Approximate significance of smooth terms:									
Calendar Week ^a	8.12***	1.86	1.00	8.59***	8.02***	1.00	4.07***	7.81***	3.47
Time ^a	5.12***	2.17	1.73	3.67	1.50	1.00	1.00	1.00	1.00
Adj. R ²	0.15	0.33	0.13	0.21	0.08	0.23	0.15	0.16	0.19

Notes: * $P < .05$; ** $P < .01$; *** $P < .001$

^a Estimated Degrees of Freedom

GAM results in Table S4 give the coefficients and goodness of fit for models of search spikes. The primary coefficients of interest, whether there is a spike in Google Searches during a particular protest are visualized in Figure 4 with 95% confidence intervals. As in Figure 4 each thematic category of search terms (see Supporting Table S1) is fit to a separate model, with an additional model for all 41 terms. We make some observations here about these models in general and then focus on a handful of issues.

First, search data is relatively noisy in the sense that goodness of fit statistics indicate that modeling search behavior on seasonal patterns yields low to moderate adjusted r-squared estimates, even when including terms for protest waves. Goodness of fit statistics range from $R^2 = .08$ to $R^2 = .33$. Second, as noted in the main text, different clusters of terms are associated with different protest waves. The cluster of terms least explained by protest and seasonal variation are historical figures ($R^2 = .08$), which is an intuitive finding, as each figure has spikes on their birthdays, which are not accounted for in the model. The cluster that is most associated is protest is the group of terms denoting BLM and police violence ($R^2 = .33$). Third, the protest that has the largest and most consistent effect is the George Floyd wave. In contrast, the earliest BLM protest wave in 2014/2015 had inconsistent effects across different clusters of terms.

Table S5. OLS models of daily tweet volume (\log_{10}) for four hashtag time series

	Post- Unite the Right ^a	Pre- & Post- George Floyd ^b
Intercept	3.5240***	3.2809***
Time ^c	0.0001	-0.0008***
#AllLivesMatter	-1.1230***	-0.9095**
#BlueLivesMatter	-0.7225***	-0.4892**
#WhiteLivesMatter	-1.7830***	-2.4131***
Time × #AllLivesMatter	-0.0001	0.0005**
Time × #BlueLivesMatter	0.0002	0.0005*
Time × #WhiteLivesMatter	-0.0020***	0.0005**
Post-George Floyd		1.6010***
Time × Post-GF		-0.0055***
#AllLivesMatter × Post-GF		-0.3373*
#BlueLivesMatter × Post-GF		-0.8242***
#WhiteLivesMatter × Post-GF		0.5901***
Time × #AllLivesMatter × Post-GF		-0.0015*
Time × #BlueLivesMatter × Post-GF		-0.0012
Time × #WhiteLivesMatter × Post-GF		-0.0024***
Adjusted R ²	0.8687	0.9324

Notes: * $P < .05$; ** $P < .01$; *** $P < .001$

^a The first model estimates the decline of hashtag volume in the year following the Unite the Right rally and BLM counter-protests.

^b The second model includes a structural break to compare the pre-George Floyd baseline (2019) to a post-George Floyd baseline (August-December 2020); all 8 lines from the second model (pre- and post-George Floyd for each of the 4 hashtags) are visualized in the bottom left panel of Figure S1.

^c Time is measured from the beginning of each period (2017-08-11, 2019-01-01, or 2020-08-01,) such that the intercept represents expected number of tweets on Day 0.

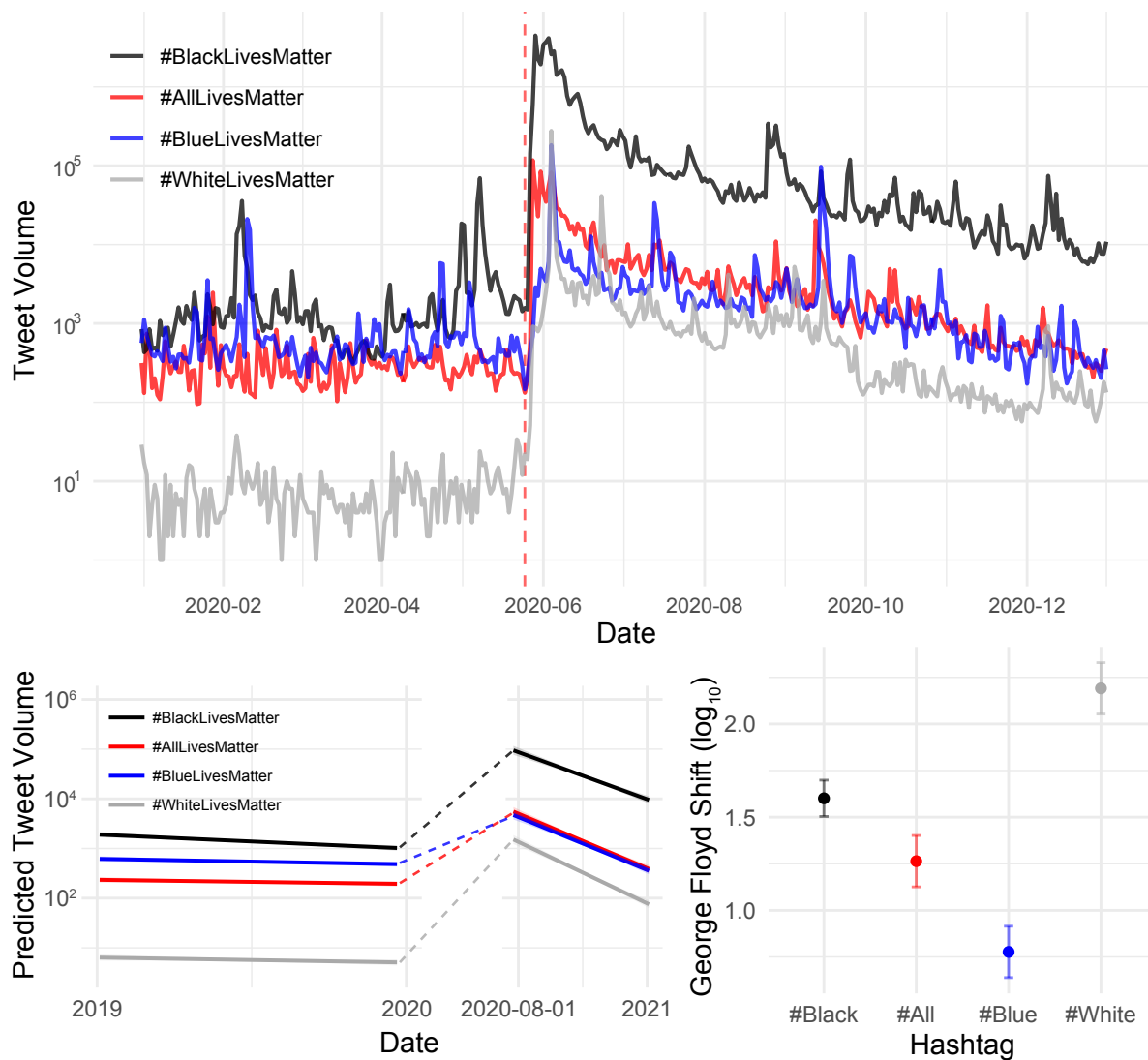


Fig. S1. Weekly hashtag volume for #BlackLivesMatter and three opposing terms before and after George Floyd protests Top: Daily hashtag volume for 2021 (George Floyd protests begin at the red dashed line.) Bottom left: Regression lines for pre- and post-George Floyd “baselines” for four hashtags corresponding to Table S5. Bottom right: Expected shift in tweet volume from 2019 to new “baseline” beginning August 2020 with 95% confidence intervals, corresponding to the dashed lines in the left panel. All pairwise comparisons are significantly different at $P < 0.0001$, except #BlackLivesMatter–#WhiteLivesMatter ($P = 0.0014$.)

Table S6. Baseline shift in term frequency for post- vs. pre-George Floyd protests

Term	Search	News		Twitter		Wikipedia		Wikipedia Page
	Ratio ^a	Ratio ^a	Volume ^b	Ratio ^a	Volume ^b	Ratio ^a	Volume ^b	
Abolition	0.92	2.20	9	2.57	4352	1.05	1500	Abolitionism
Angela Davis	1.72	3.32	2	1.76	1087	2.06	3817	Angela Davis
Antiracist	28.75	13.85	2	3.97	989	2.43	696	Anti-racism
Black Lives Matter	12.23	22.93	171	32.35	52622	9.65	19019	Black Lives Matter
Black Panthers	1.28	2.04	2	1.27	612	1.33	4704	Black Panther Party
Black Power	1.39	3.19	3	2.09	7212	1.12	580	Black Power
Civil Rights	1.11	1.89	134	2.02	21890	1.16	3138	Civil rights movement
Decriminalization	1.38	1.28	3	1.22	531	0.66	231	Decriminalization
Defund the Police	inf	inf	24	3699.34	13368			
Eric Garner	0.46	1.05	3	0.14	241	0.80	1562	Killing of Eric Garner
Hands Up Don't Shoot	nan	nan	0	6.77	187			
I Can't Breathe	1.87	nan	0	1.62	1505			
Identity Politics	0.91	1.40	7	1.03	2904	1.53	1751	Identity politics
Inequality	1.19	1.61	76	1.19	14753	1.05	1199	Wealth inequality in the United States
Institutional Racism	1.83	4.25	6	1.65	996	2.75	2927	Institutional racism
Jim Crow	1.29	2.21	16	2.72	3733	2.23	12752	Jim Crow laws
Malcolm X	0.88	3.22	5	1.81	2695	1.02	9747	Malcolm X
Martin Luther King	0.76	1.94	27	1.37	4553	1.08	12519	Martin Luther King Jr.
Mass Incarceration	1.28	1.45	9	1.29	1639			
Michael Brown	1.02	1.84	5	2.17	1340	1.38	3510	Shooting of Michael Brown
Philando Castile	inf	3.17	1	5.81	331	1.67	1814	Shooting of Philando Castile
Police Brutality	1.71	5.08	77	5.01	29359	1.15	942	Police brutality
Police Shootings	2.06	2.15	6	2.31	11485			
Prison Abolition	inf	inf	0	2.36	298	1.64	304	Prison abolition movement
Prison Reform	1.17	1.38	3	1.37	826	0.88	221	Prison reform
Racism	1.68	2.82	232	1.58	121855	1.02	3678	Racism
Redlining	2.17	2.98	4	2.22	480	2.02	2193	Redlining
Say Her Name	2.59	inf	2	2.93	2928	5.20	298	SayHerName
Segregation	1.08	1.72	21	1.74	4554	1.11	1802	Racial segregation in the United States
Slavery	1.04	1.74	46	1.46	24815	1.03	3057	Slavery
Social Justice	1.25	3.21	69	2.14	13845	1.19	1952	Social justice
Stokely Carmichael	1.07	1.62	0	2.94	50	1.90	2040	Stokely Carmichael
Systemic Racism	9.61	7.73	7	9.44	10313	5.60	150	Systemic racism
Tamir Rice	2.31	3.50	1	2.01	375	1.97	1986	Shooting of Tamir Rice
The New Jim Crow	1.29	30.48	0	2.02	133	1.57	553	The New Jim Crow
Trayvon Martin	7.68	2.65	4	5.98	1081	1.48	1967	Trayvon Martin
War on Drugs	1.16	1.25	6	1.17	1626	1.09	1893	War on drugs
White Nationalism	0.43	0.54	4	0.34	1039	0.81	1062	White nationalism
White Power	1.26	1.95	3	1.50	8253			
White Privilege	1.41	2.78	9	1.43	8829	1.32	1722	White privilege
White Supremacy	1.30	1.76	31	1.32	18229	1.19	3630	White supremacy

Notes: In addition to the raw data for Figure 5 (Wikipedia page visits), we show the same data for Google Search, news media, and Twitter.

^a The ratio of expected daily volume for August-December 2020 over the same period in 2019.

^b The expected daily volume for the post-George Floyd period.